

WHAT IS CLAIMED IS:

1. A method of producing a Group III nitride compound semiconductor substrate, comprising:

the first layer forming step of forming a first Group  
5 III nitride compound semiconductor layer by a halide vapor-phase  
epitaxy method (i) directly on a silicon (Si) substrate or (ii)  
after forming a buffer layer on said silicon substrate; and  
the silicon substrate removing step of removing almost  
the whole of said silicon substrate from a rear surface by etching  
10 after the completion of the first layer forming step or during  
the first layer forming step.

2. A method of producing a Group III nitride compound semiconductor substrate according to claim 1, further  
15 comprising: the second layer forming step of forming a second  
Group III nitride compound semiconductor layer by a halide  
vapor-phase epitaxy method after the silicon substrate removing  
step

20 3. A method of producing a Group III nitride compound semiconductor substrate according to claim 2, further  
comprising: the first layer removing step of removing a large  
part of said first Group III nitride compound semiconductor  
layer from said rear surface by etching after the completion  
25 of the second layer forming step or during the second layer

forming step.

4. A method of producing a Group III nitride compound semiconductor substrate according to claim 3, further comprising: the etching stopper layer forming step of forming, as an etching stopper layer, a Group III nitride compound semiconductor layer containing a larger amount of aluminum than an amount of aluminum contained in each of the first and second Group III nitride compound semiconductor layers before the second layer forming step, wherein the first layer removing step is provided for completely removing the first Group III nitride compound semiconductor layer.

5. A method of producing a Group III nitride compound semiconductor substrate according to claim 2, wherein the first layer forming step is carried out at a temperature of not higher than 1000°C whereas the second layer forming step is carried out at a temperature of not lower than 1000°C.

6. A method of producing a Group III nitride compound semiconductor substrate according to claim 1, wherein a film thickness of said first Group III nitride compound semiconductor layer formed in the first layer forming step is not larger than 200  $\mu\text{m}$ .

25

7. A method of producing a Group III nitride compound semiconductor substrate according to claim 1, wherein said buffer layer is formed as a Group III nitride compound semiconductor layer containing aluminum or as a multi-layer including at least one Group III nitride compound semiconductor layer containing aluminum.

8. A method of producing a Group III nitride compound semiconductor substrate, comprising:

10 the first layer forming step of forming a first Group III nitride compound semiconductor layer by a halide vapor-phase epitaxy method (i) directly on a silicon (Si) substrate or (ii) after forming a buffer layer on said silicon substrate; and

15 the silicon substrate removing step of removing almost the whole of said silicon substrate from a rear surface by etching after the completion of the first layer forming step or during the first layer forming step;

20 wherein the first layer forming step is carried out at a temperature of not higher than 1000°C whereas the second layer forming step is carried out at a temperature of not lower than 1000°C.